EFFECTIVENESS OF A STRUCTURED EXERCISE PROGRAMME ALONG WITH COGNITIVE BEHAVIOURAL THERAPY ON PHYSICAL AND EMOTIONAL DISTURBANCES AMONG ADOLESCENTS WITH PCOS

Dissertation submitted to

The Tamil Nadu Dr. M.G.R. Medical University

Chennai

In partial fulfilment of the requirements for the degree of

MASTER OF PHYSIOTHERAPY

(OBSTETRICS AND GYNAECOLOGY)

Reg. No. 271760001

May – 2019

COLLEGE OF PHYSIOTHERAPY
SRI RAMAKRISHNA INSTITUTE OF PARAMEDICAL SCIENCES
COIMBATORE – 641044

CERTIFICATE

This is to certify that the dissertation work entitled **"Effectiveness of a structured exercise programme along with cognitive behavioural therapy on physical and emotional disturbances among adolescents with PCOS"** was carried out by the candidate bearing the **Register No. 271760001 (May 2019)** in College of Physiotherapy, SRIPMS, Coimbatore, affiliated to the Tamil Nadu Dr. M.G.R Medical University, Chennai towards partial fulfilment of the **Master of Physiotherapy (Obstetrics and Gynaecology).**

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

Place:

Date:

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LIST OF ABBREVIATIONS

- WHO - World Health Organization
- PCOD - Polycystic Ovary Disease
- PCOS - Polycystic Ovary Syndrome
- BMI - Body Mass Index
- BDI - Beck Depression Inventory
- BAI - Beck Anxiety Inventory
- USG - Ultra Sono Graphy
- CBT - Cognitive Behavioural Therapy
- WHR - Waist Hip Ratio
- LDL - Low Density Lipo Protein
- HDL - High Density Lipo Protein
- LH - Luteinizing Hormone
- SHBG - Sex Hormone Binding Globulin
- GNRH - Gonadotropin Releasing Hormone
- CVD - Cardio Vascular Disease

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Abstract

ABSTRACT

Background: Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders, affecting 210 million women worldwide. PCOS can be highly distressing to the patients and their body image appears to be strongly associated with higher levels of depression, psychological and psychosexual morbidity and increase exposure to stressful stimuli. There is a close association between PCOS and obesity and it is also associated with increased waist circumference. Lifestyle modification, including increased physical activity is the first-line approach in managing PCOS.

Objective: To evaluate the effectiveness of a structured exercise programme along with Cognitive Behavioural Therapy (CBT) on the physical and emotional disturbances among adolescents with PCOS.

Participants and Methods: This study was conducted on 30 adolescents diagnosed with PCOS recruited through purposive sampling. A structured exercise programme consisting of aerobic, resisted exercises and CBT sessions were given to all the participants for duration of 5 weeks. Values of BDI (Beck Depression Inventory), BAI (Beck Depression Inventory), BMI (Body Mass Index) and WHR (waist hip ratio) were collected before and after the therapeutic intervention.

Results: From the pre-test and post-test values, using paired “t” test, the calculated ‘t’ value for BMI was 6.67, at ‘p’ 0.00 which is < 0.05. From the pre-test and post-test values, using paired “t” test, the calculated “t” value for WHR was 11.94 at ‘p’ 0.00 which is < 0.05. From the pre-test and post-test values, using paired “t” test, the calculated “t” value for severity of anxiety was 10.36, at ‘p’ 0.00 which is < 0.05. From the pre-test and post-test values, using paired “t” test, the calculated “t” value for severity of depression was 11.18 at ‘p’ 0.00 Which is < 0.05 value significance.

Conclusion: Aerobic and resisted exercise programme along with CBT can be used as an effective non-pharmacological method to help PCOS adolescents overcome their stress and depression levels in addition to reducing their BMI and WHR in the short term.

Keywords: PCOS**,** Aerobics, Resisted, Anxiety, Depression, CBT.

Introduction

1. INTRODUCTION

1.1 TOPIC OVERVIEW

Polycystic ovary syndrome [PCOS] is one of the most common endocrine disorders affecting 5-10% in UK of all the women in the reproductive age and is associated with chronic anovulation, hyperandrogenism and insulin resistance. These patients also have elevated triglycerides, low density lipoprotein [LDL] cholesterol levels and low high-density lipoprotein [HDL] cholesterol levels. Women with PCOS may complain about variable clinical manifestations including oligomenorrhea, hirsutism, acne and infertility. Approximately, 75% of these women suffer from infertility due to anovulation. (1)

According to the Rotterdam criteria, there are three key diagnostic features of PCOS which includes anovulation, hyperandrogenism and polycystic ovaries. The patients must display two of the three phenotypes to be diagnosed as having PCOS. Anovulation is the most common phenotype among PCOS patients with up to 90% of women with PCOS experiencing some type of anovulation.

This is often displayed as oligomenorrhea with less than eight periods in one year. (2)

PCOS is also reported to be associated with obesity, insulin resistance, type II diabetes, dyslipidemia, hypertension, cardiovascular disease and endometrial carcinoma. Approximately 50-60% of women

with this syndrome are overweight or obese compared to 30% of women in the general population. [2]

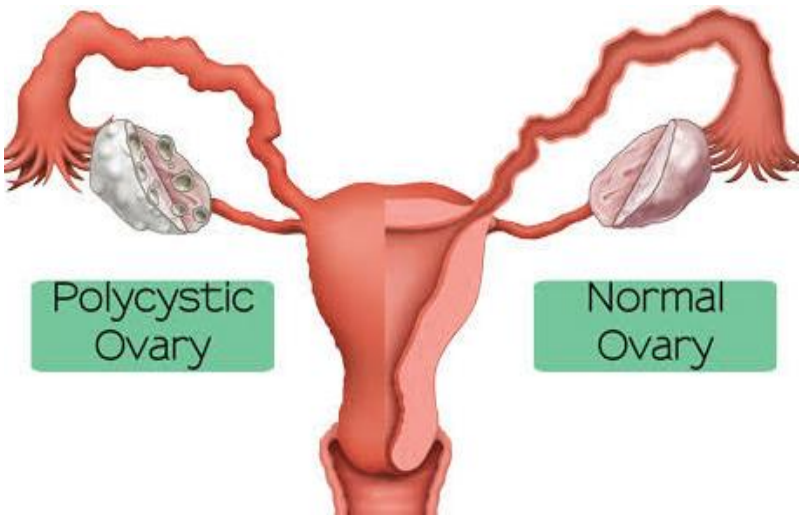


Fig. 1 Polycystic ovary syndrome

The primary aetiology of this complex disease remains a hen-and-egg mystery. The sympathetic nervous system may be an important aetiological factor. PCOS is associated with peripheral and central factors that influence sympathetic nerve activity. [3]

Endocrine characteristics of PCOS are elevated serum concentration of androgens and luteinizing hormone [LH] and decreased concentrations of sex hormone binding globulin [SHBG]. The anovulation is associated with disturbances in the feedback from the ovarian steroid hormones to the hypothalamus and pituitary, resulting in disturbances in the pulsatility of Gonadotropin releasing hormone [GnRH] release. It has been suggested that the elevated concentrations of LH are due to an abnormal feed back by estrogens and that the high tonic concentrations of LH in PCOS are detrimental to follicular growth. The low concentrations of SHBG are associated

with a relative increase in unbound concentrations of and testosterone CV concentrations, which may further increase clinical expressions of hyperandrogenism, such as Hirsutism. [3]

PCOS affects the women's ovaries, the reproductive organs that produce estrogens and progesterone which are the hormones that regulate menstrual cycle. The ovaries also produce a small amount of male hormones called androgen. Symptoms related to elevated androgen levels include acne, excess hair growth on the body (Hirsutism) and male pattern hair loss.

Other PCOS signs and symptoms include oily skin, dandruff, skin discolouration; high cholesterol levels and elevated blood pressure. Up to 70% of women with PCOS had not been diagnosed. A regular bleeding pattern is usually attained by one and a half years after menarche, if this period exceeds three years, PCOS must be suspected.[4]

PCOS is a common cause of secondary amenorrhoea or oligomenorrhea in adolescent women. About 90% of women with oligomenorrhea and 30% with amenorrhoea may have this condition. Hirsutism, acne and obesity may be associated. [4]

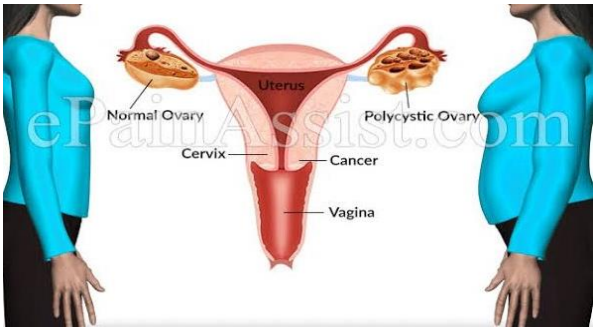


Fig. 2 PCOS associated with obesity

Women with this syndrome have, over the course of their life, an increased risk of coronary disease, diabetes and endometrial cancer. The disorder is probably the most common hormonal abnormality in women of reproductive age and certainly is a leading cause of infertility. The three broad reasons that PCOS patients seek medical care are menstrual cycle disturbances, infertility problems of appearance and low self esteem arising from obesity and excessive hair growth, metabolic derangements, including abnormalities in lipid levels, glucose and hypertension. Treatment of PCOS is focused on both normalizing short term signs of hyperandrogenism and anovulation and reducing metabolic complications. (4)

Medication is generally prescribed to induce regular periods, thereby reducing the risk of uterine cancer. For acne and excess hair growth, the diuretic spironolactone can help. For women who desire pregnancy, clomphene can be used to induce ovulation. (5)

Women with PCOS need some long – standing treatment to diminish their increased risk for endometrial-cancer, hypertension and type II diabetes. Traditional treatment in women with PCOS and anovulation is pharmacological induction of ovulation. Antiestrogen is very effective, but side – effects such as nausea, multiple pregnancy and ovarian hyper stimulation syndrome are common. A Need for methods that allow the substitution or reduction of pharmacological interventions is required. (6)

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. People are generally considered obese when their Body Mass Index [BMI] is over 30kg/m^2. Obesity increases the likelihood of various diseases. (6)

Obesity in women with PCOS negatively affects all clinical features and 5 – 10% weight loss has shown promising results on reproductive, metabolic and psychological level. Incorporating a healthy diet, increasing physical activity and changing dysfunctional thought patterns in women with PCOS are key points in losing weight.(6)

Body weight is not static it varies throughout the life of women in response to their physical activity, environmental, nutritional, social, and psychological factors. Obesity is associated with many hormonal dynamics. Menstrual disorders are common among women with obesity. It includes dysfunctional uterine bleeding and PCOS. Exercises are recommended as the first-line of treatment for oligomenorrhea, Hirsutism, infertility and obesity in PCOS by the majority of endocrinologists and gynaecologists. (8)

Published studies have demonstrated the positive effects of exercise training on maximal oxygen consumption [maxVo_2], weight and waist circumferences in PCOS patients. Combined aerobic and resistance exercises are more effective than aerobic or resistance alone in improving insulin sensitivity women with PCOS. (8)

An aerobic exercise is a planned structured physical activity designed to improve or maintain physical fitness. Aerobic exercises resulted in a greater reduction in fasting insulin and insulin resistance. Exercise-induced changes in visceral fat are noted down in one recent study using single-slice computed tomography which measured changes in visceral fat with exercise training in PCOS.A resisted exercise is any form of active exercise in which dynamic or static muscle contraction is resisted by an outside force applied manually or mechanically. Resisted exercises are used to enhance muscle performance, improve or maintain muscle strength of connective tissue, tendon, ligaments and they contributed to greater bone mineral density. They also bring about positive changes in body composition; increases lean muscle mass and enhance feeling of physical well being. [14]

According to the International Classifications of Disease [1992], depressed mood, loss of interest or pleasure, reduced energy and lack of concentration are the key symptoms of depression. Additionally, it can cause disturbance of sleep, appetite, low self – confidence, negative view of one's self, feeling of guilt and thoughts of suicide, or even ending one's life. [17]

Development of anxiety and depression in PCOS is considered as multifactorial. Some researchers have suggested that physical symptoms, such as acne, Hirsutism and obesity, are linked to these psychiatric morbidities. There are very few studies in Indian research assessing the prevalence of anxiety and depression in PCOS. Common features of PCOS can be highly distressing to the patients and their

body image appears to be strongly associated with higher levels of depression, psychological and psychosexual morbidity and increase exposure to stressful stimuli. [17]

Cognitive behavioural therapy [CBT] is used to create awareness and to restructure dysfunctional thoughts about lifestyle and self- esteem. CBT is a time limited, problem focused intervention that seeks to reduce emotional distress through the modification on maladaptive beliefs, assumption, attitude and behaviour. [22]

CBT training showed promising effects with significant reductions in obesity and depression in adolescents with PCOS. Also observed are decreased rates of physiological co morbidities such as menstrual irregularities; high percent of fat mass, sleep related breathing disorders; blood pressure and mid-region adiposity associated with PCOS. [22]

CBT for depression is a treatment process that helps patients to alter their beliefs and behaviours that produce certain mood states. The therapeutic strategies of cognitive-behavioural management of depression occur in three phases, such as focus on automatic thoughts and depressogenic cognitive styles, focus on the way in which the person relates to others, the behavioural changes necessary to enable the individual to recover from the problem situation. [23]

1.2 NEED FOR THE STUDY

PCOS is a most common endocrine disorder in women of reproductive age. PCOS affected 116 million women in worldwide as of 2010. In India, PCOS prevalence increased gradually from 2.2% to 26%. In most studies, adult women aged 18 – 45 years were found to be affected with PCOS. [5]

According to the National Institute of Health [NIH] criteria, 4-10% of women in the reproductive age suffered from PCOS in USA. In developing countries, 6-10% of the female population are affected by PCOS. [5]

PCOS is associated with multiple metabolic abnormalities. The patients with PCOS may be expected to have a higher morbidity and mortality from the squeal of the metabolic syndrome. The resulting physiological dysfunction produced by interrelated metabolic and hormonal factors, predisposes patients with PCOS to different complications like cardiovascular disease [CVD], endometrial hyperplasia, cancer and miscarriage. [6]

PCOS is the cause of up to 30% of infertility in couples seeking treatment. 40-60% of women with PCOS have an increased prevalence of obesity in the general population. The current obesity epidemic suggests that the prevalence of PCOS may raise in the future. [6] It is the leading cause of female infertility and is responsible for a cluster of symptoms that can affect the body physically and emotionally. Thus, PCOS adversely affects endocrine, metabolic, reproductive and cardiovascular health. It seems to affect all areas of the body and not just the reproductive symptoms. [6]

Resistance training is also effective for improving insulin sensitivity and reducing body composition. Combining aerobic and resistance exercise has been reported to be more efficacious for improving insulin sensitivity and glycaemic control and reducing abdominal fat in various obese groups compared with either forms of exercise alone. Aerobic exercise training improves body composition and reduces a number of CVD risk markers in overweight and obese individuals. [7]

Prevalence of anxiety in women with PCOS ranges from 34% to 57%. Prevalence of depression in PCOS varies from 28% to 64%. Development of anxiety and depression in PCOS is considered as multifactorial. [11]

CBT has been tested and found to be a highly effective psychotherapy in the western world for a wide range of conditions, however, its training and practice in India is limited and unstructured. CBT helps the participants with PCOS to understand the thoughts and feelings that influence their behaviour. [18]

As PCOS is a lifelong condition with increased risk of associated disorders and with pharmacological treatments exerting adverse effect, it is of importance to investigate the efficacy of exercise training and CBT that might reduce the impact of physical and emotional disturbances associated with PCOS. If a possible solution and treatment is developed, these patients can have a sense of hope toward a positive effect.

1.3 OBJECTIVE OF THE STUDY

To evaluate the effectiveness of a structured exercise programme along with cognitive behavioural therapy on the physical and emotional disturbances among adolescents with PCOS.

1.4 RESEARCH QUESTION

Is structured exercise programme along with cognitive behavioural therapy effective on the physical and emotional disturbances among adolescents with PCOS?

1.5 HYPOTHESIS

1.5.1 Null Hypothesis

There is no significant effect on the physical and emotional disturbances in adolescents with PCOS when structured exercise programme along with CBT were administered.

1.5.2 Alternate Hypothesis

There is a significant effect on the physical and emotional disturbances in adolescents with PCOS when structured exercise programme along with CBT were administered.

Review of Literature

2. REVIEW OF LITERATURE

1. **G. Jiskoot et al (2017).** This study was performed on 210 participants with PCOS who were randomly assigned to three groups. Group 1 received CBT by the multidisciplinary team, Group 2 received CBT by the multidisciplinary team and short message service and Group 3 was control group. They concluded that CBT provided by a multidisciplinary team improves reproductive and metabolic outcomes, such as quality of life, weight loss and behavioural changes.

2. **Rosana Maria Dos Reis et al (2017).** This study proved that aerobic exercises are more highly recommended, a consistent training protocol including aerobic and strength exercises, either in the same session or on alternate days. Intervention programs with aerobic training or strength training performed exclusively induce favourable adaptations in women with PCOS.

3. **Antepekke et al (2016).** This study was the first to examine the contribution of systemic O_2 delivery and arteriovenous O_2 difference to Vo_2 peak in overweight women with PCOS. 15 overweight women with PCOS were selected. They concluded that performing maximal incremental cycling exercise can alter the cardio respiratory response to exercise in PCOS women.

4. **Suneet Kumar Upadhaya et al (2015).** This cross-sectional study was conducted among 200 patients with PCOS. Goal of this study was to assess prevalence of anxiety and depression in PCOS

patients. High anxiety level in PCOS may be due to infertility, loss of sexuality, acne, Hirsutism and obesity. They concluded that high level of anxiety and depression was prevalent in PCOS patients.

5. **Volkan Turan et al (2015).** This study on thirty women with PCOS who were randomly assigned to 2 groups, for a period of 8 weeks. Group 1 received aerobic exercise. Group 2 was control group. The study proved that 8 weeks of exercise programme improves reproductive and metabolic disorders in non-overweight women with PCOS and improves quality of life.

6. **Francesca Conte et al (2015).** Concluded in their study that physical activity is likely to be beneficial to the mental health of women with PCOS. 49 overweight and obese women were selected randomly. All the patients received diet and aerobic exercise, or diet and combined aerobic and resistance exercise. They proved that exercise and physical activity improved mental health in PCOS women and physical activity is a positive intervention for both physical and mental health for these women.

7. **Amy D. Anderson et al (2014).** This study proved that childhood obesity can impact development of PCOS in adolescents. They suggest that all adolescent girls with obesity should be asked about possible symptoms of PCOS and that all adolescents with diagnosed PCOS should be screened for obesity.

8. **Gokhan Acmaz et al (2013).** This study determined that women with PCOS were facing problems such as depression, anxiety and low self- esteem. In this, study they assigned 2 groups. Group 1(experimental group) consisted of 86 patients were received CBT for a period of 10 weeks. Group 2 consisting of 42 patients was control group. They concluded that CBT improved mental health like depression, anxiety and low self esteem in PCOS women.

9. **Zainabfotowalzach et al (2012).** This study explained about the level of anxiety, depression, social anxiety and low self-esteem in women with PCOS. All the women in this study received CBT for a period of 12 weeks. They proved that CBT significantly improved psychosocial factors as well as reproductive and metabolic outcomes.

10. **Kavita Mandrelle et al (2012).** This study found prevalence of metabolic syndrome of 37.5% which constitutes more than a third of the PCOS women who presented with infertility. The age of >25 years and presence of central obesity with a waist hip ratio >0.85 were identified as risk factors for metabolic syndrome.

11. **Ronit Mechtinger et al (2012**). This study compared normal BMI patients and severe obesity patients. The severely obese associated with a greater prevalence of spindle anomalies and non-aligned chromosomes in failed fertilized oocytes. They suggested that severely obese patients with a proportion of the mature oocytes may have a compromised quality that precedes normal completion of fertilization.

12. **Eden R. Cardozo et al (2012).** This study found out that among women with infertility, there is limited knowledge of reproductive outcomes affected by obesity. They randomly selected 150 female infertile women with obesity. Subjects were administered the rapid estimate of adult literacy in medicine-short form and a questionnaire on the health risks of obesity and investigators obtained their height and weight measurements. They concluded that public education is needed to increase awareness and women undergoing fertility treatment have to be motivated for reproductive success and may be uniquely receptive to obesity education and weight loss intervention.

13. **Morteza Taghavi et al (2011).** This randomized study explained that about 4-6 weeks of aerobic training program improves metabolic and hormonal profile in young women with PCOS. Totally, twenty obese PCOS patients were selected, all the patients received aerobic exercise for 4-6 weeks, metabolic and hormonal profiles were assessed after the interventions. This study shows significant difference in metabolic and hormonal profile post intervention.

14. **Cheryce L. Harrison et al (2010).** This study suggested that lifestyle modifications, including increased physical activity can be used as a first-line approach in managing PCOS. They concluded that regular, moderate – intensity aerobic exercise over a short period improved reproductive outcomes including ovulation and menstrual cycle regulation in addition to reduced weight.

15. **R.L. Thomson et al (2010).** This randomized study explained about the benefits of exercise training and its recommendation as very important in PCOS. They selected 30 participants with PCOS, who received aerobic exercise and resisted exercises plus lifestyle modifications. They concluded that exercise appears to have beneficial effects, with reports of improvements in fitness, body composition, fasting insulin, menstrual cyclicity, ovulation, self esteem, quality of life scores and depression.

16. **Dena L. Rofey et al (2009).** This study selected 12 adolescents with PCOS, obesity, depression and evaluated the effectiveness of an enhanced CBT for physical and emotional disturbances. They suggested that the CBT approach can be useful and applicable to women who receiving ART (Assisted Reproductive Therapy).

17. **Nillyor, Dafna Haran et al (2009).** Found in this study that CBT is more effective for the treatment of in the acute phase depression.

18. **Onna E. Janssen et al (2008).** This study explained that PCOS causes a major reduction in quality of life and psychological well-being and severely limits sexual satisfaction and self-worth among women, particularly obese and excessive body hair. They selected 393 patients with PCOS; quality of life assessed using a self-administered questionnaire. They determined degree of satisfaction with issues relating to emotion, hair growth, body weight, infertility.

19. **Maiya et al (2008).** This study concluded that graded aerobic exercise is a definite tool in decreasing the body weight in obese women with PCOS. This study also proved that graded aerobic exercise helps in reducing the cyst size, thereby increasing the ovulation in PCOS women.

20. **Vania Bitencourt Powell et al (2008).** This study focuses on the use of cognitive techniques and reviewed studies on the efficacy of CBT in the treatment of depression. They suggested that fundamentals of CBT in the treatment of depression are one of the therapeutic modalities with a highest empirical evidence of efficacy, whether applied alone or in combination with pharmacotherapy.

21. **Yarkin Ozenli et al (2008).** This study compared healthy women with women having PCOS for the levels of depression, anxiety and ways of coping skills. This was cross-sectional study and the participants were assigned to two groups. Group 1, consisted of 35 women with PCOS, Group 2 consisted of 35 healthy women. All participants completed a socio-demographic questionnaire form including questions on age, education and socioeconomic status and history of physical and mental status. Women with PCOS had significantly higher scores on the questionnaire.

22. **Brenda Bruner et al (2006).** This pilot study assessed the effects of exercise and nutritional counselling on hormonal, menstrual and reproductive function among 12 female participants with PCOS. They were received endurance exercise and resistance exercise

training for a period of 12 weeks. They found that lifestyle modifications in the form of endurance and resistance exercise may provide beneficial effects with regards to the biochemical profile of obese women with PCOS.

23. **Farideh Zafari Zangeneh et al (2006).** This study explained that women with PCOS have lower self-esteem and have higher levels of depression and psychological distress owing to the physical appearance of hyperandrogenism, including obesity. They suggested that the therapy of PCOS should tackle both physical and psychological complaints.

Materials and Methodology

3. MATERIALS AND METHODOLOGY

3.1 STUDY DESIGN

This is a single group pre-test and post-test quasi experimental study design.

3.2 STUDY SETTING

The study was carried out in the Department of Physiotherapy under supervision of the staff in-charge, at Sri Ramakrishna Hospital, SRIPMS, Coimbatore.

3.3 SAMPLING METHOD

The subjects were included in the study by purposive sampling method.

3.4 SAMPLE SIZE

A total of 30 adolescents with PCOS who fulfilled the inclusion criteria were assigned to a single group. They received structured exercise programme with cognitive behavioural therapy.

3.5 STUDY DURATION

The study duration was 6 months.

3.6 TREATMENT DURATION

Treatment duration was 5 weeks.

- Aerobic and resisted exercises given: 60 minutes per session and 3 times per week for 5weeks.
- Cognitive behavioural therapy: 1 session per week of 45 minutes for 5weeks.

3.7 SELECTION CRITERIA

3.7.1 Inclusion Criteria:

- Subjects with overweight and obese category BMI
- WHR >0.85
- Age group 18 – 25 years
- PCOS confirmation according to Rotterdam consensus criteria
- Menstrual irregularities
- Low ovulation or anovulation
- Clinical and biochemical symptoms of hyperandrogenism
- Multiple primary follicles in ovaries determined by ultra sonography
- Subjects willing to participate in the study
- Subjects able to read English

3.7.2 Exclusion Criteria:

- Pregnancy
- Adrenal disease
- Fertility treatment or oral contraceptives
- History of cardiovascular, liver, kidney, or respiratory distress
- Diabetes mellitus
- Uncontrolled hypertension
- Thyroid abnormalities
- Neurological or musculoskeletal complications

3.8 PROCEDURES

This study was conducted on 30 adolescents confirmed with PCOS. They were selected based on the selection criteria and the purpose and nature of the study were explained to all participants and informed consent was obtained. BDI [Beck depression inventory] BAI [Beck anxiety inventory] Body mass index [BMI] and waist hip ratio [WHR] values were measured before and after the therapeutic intervention for all participants.

AEROBIC EXERCISE

Walking: All the 30 subjects enrolled into the study were advised to perform brisk walking with moderate intensity for a minimum of 30 minutes. They were instructed to perform it at a comfortable speed, for 3 days a week for duration of 5 weeks.

RESISTED EXERCISES

A resisted exercise is any form of active exercise in which dynamic or static muscle contraction is resisted by an outside force applied manually or mechanically.

The subjects were instructed to perform the following specific resisted exercises using a low resistance theraband.

1. Knee extension exercise:

Position of the subject: Sitting in chair comfortably

The subjects were instructed to assume a comfortable sitting position with their hip and knee flexed to $90^{0.}$ One end of the theraband was tied to the ankle joint, while the other end was tied to the chair. Now the subjects were asked to raise their leg from ground by opposing the resistance up to end range. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercise was performed in the other limb subsequently.

Fig.3 Knee extension exercise

2. Hip abduction exercise:

Position of the subject: Standing

The subjects were instructed to assume comfortable standing position parallel to the table to which one end of the theraband was tied, while the other end was tied to lower limb of the subjects. They were instructed to move their hip away from their body. The subjects performed this for 15 repetitions, 3 sets and 1-minute rest interval between each set. The exercise was repeated in other the limb subsequently.

Fig .4 Hip abduction exercise

3. Hip adduction exercise:

Position of the subject: Standing

The subjects were instructed to assume comfortable standing position parallel to a table to which one end of the theraband was tied. While the other end was tied to lower limb of the subjects near the ankle joint. The subjects were instructed to move their hip towards their body. The exercise was repeated in the other limb subsequently.

Fig .5 Hip adduction exercise

4. Hip flexion exercise:

Position of the subject: Standing

The subjects were instructed to assume comfortable standing position in front of the table to which one end of the theraband was tied, while the other end was tied to lower limb of the subjects near the ankle joint. The subjects were instructed to bend their knee and move their hip upward against resistance. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercises were repeated in the other limb subsequently.

Fig .6 Hip flexion exercise

5) Hip extension exercise:

Position of the subject: Standing

The subjects were instructed to assume comfortable standing position in front of the table to which one end of the theraband was tied, while the other end was tied to the lower limb of subjects near the ankle joint. The subjects were instructed to move their legs backward with knee straight against resistance. The subjects performed this exercise for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercises were repeated in the other limb subsequently.

Fig .7 Hip extension exercise

6) Back extension exercise:

Position of the subject: Prone lying on the floor

The subjects were instructed to assume prone lying position facing the floor. Their lower limbs were extended and arms placed at their side, palm facing forward with head and neck neutral. The upper body (chest and shoulders) was lifted off the ground, "crouching" towards the hip, then upper body was slowly lowered down with control. There should be no movement from hip to the toes. If there was any discomfort in their lower back, the distance between their legs were widened and the height of the lift was decreased. Here, gravity acts as a resistance. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set.

Fig .8 Back extension exercise

7) Curl ups:

Position of the subjects: Supine lying on the floor.

The subjects were instructed to assume supine lying position on the floor by facing upward with their knees bent and the balls of feet and heels placed flat on the ground. Their hands were placed on opposing shoulder, so that arms were crossed over the chest, or behind the head. The abdominal muscles were tightened by drawing in the belly bottom to the spine. The heels and toes were kept flat and the head was lifted first, followed by the shoulder blades. Gravity acts as a resistance in this exercise. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set.

Fig .9 Curl ups exercises

8) Biceps curl:

Position of the subjects: Standing

The subjects were instructed to assume standing position parallel to the table, to which one end of the theraband was tied, while the other end was rolled around any one hand. They were instructed to bend their elbow against the resistance force of the theraband. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercises were repeated on the other limb subsequently.

Fig. 10 biceps curl exercise

9) Triceps extension:

Position of the subjects: Standing

The subjects were instructed to assume standing position parallel to the table to which one end of the theraband was tied, while the other end was rolled around anyone hand. The elbow was straightened against the resistance force of the theraband. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercise was repeated on the other limb subsequently.

Fig .11 Triceps extension exercise

10) Shoulder abduction:

Position of the subjects: Standing

The subjects were instructed to assume comfortable standing position. The distal ends of the theraband was held by both hands, while the middle part was fixed with their feet, they were instructed to raise both their arms sideways against the resistance force of the theraband. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercise was repeated on the other limb subsequently.

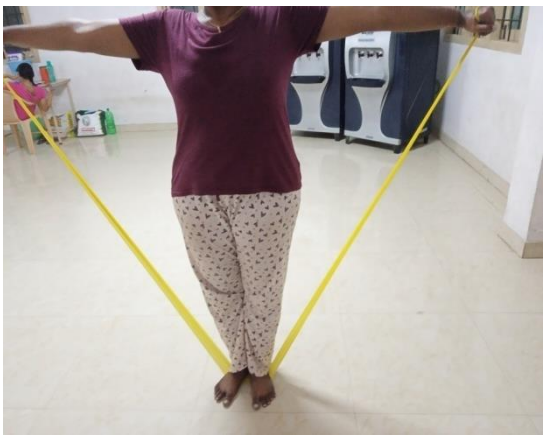


Fig .12 Shoulder abduction exercise

11) Shoulder adduction:

Position of the subjects: Standing

The subjects were instructed to assume standing position, aside the table to which one end of the theraband was tied and the other end was rolled around any one hand of the subject. They were instructed to move their shoulders towards the body against the resistance force of the theraband. The subjects performed this for 15 repetitions, 3 sets with 1-minute rest interval between each set. The exercise was repeated on the other limb subsequently.

Fig .13 Shoulder adduction exercise

COGNITIVE BEHAVIOURAL THERAPY

The subjects received 1 session of CBT in a week for 45 minutes, for a total duration of 5 weeks.

CBT focuses on:

- Cognitive restructuring
- Modifying behaviour
- Developing alternative scoping skills
- Eliminating negative automatic thoughts and dysfunctional attitudes depression.

The CBT Session included:

CBT Techniques:

TABLE -1: CBT Techniques

Session 1	Breathing exercise
Session 2	Meditation
Session 3	Imagery techniques
Session 4	Self-awareness
Session 5	Progressive relaxation training

SESSION-1

Breathing exercises

The subjects were encouraged to perform deep breathing exercise, which included apical breathing and lateral costal breathing exercise. It was performed in a relaxed manner for 10-15 minutes.

Fig.14 Relaxed breathing exercise

❖ **Apical breathing:** The subjects sat in a comfortable sitting position with shoulders in a relaxed position. Now the patients were asked to close their eyes and hands placed over the upper part of the chest little above the clavicle bone. Then, subjects were encouraged to concentrate on breathing. While doing this, their hands lightly moved in upward direction and slowly inhale through mouth (pursed lip). They repeated it for 5 to 10 times with a ratio of 4:8 then the ratio was gradually progressed**.**

❖ **Lateral costal breathing:** The subjects sat in comfortable sitting position. They were asked to close their eyes and hands were placed over the lateral aspect of the chest. Then subjects were encouraged to concentrate on breathing. While doing this, their hands slightly moved in outward direction and then slowly inhaled through their mouth. They repeated this for 5 to 10 times with a ratio of 4:8, and then the ratio was gradually progressed**.**

SESSION-2

Meditation

A few words describing the meditation procedure were told to the subjects before starting the first session.

- **Attention to position:** Environment should be quiet and warm. The subject sat straight back, cross legged on a cushion on the floor, with their hands rested on thighs, fingers gently curled, head held in a relaxed position directly above the spinal column to release the neck muscles from strain while their eyes were closed.
- **Winding down procedure:** The subjects were asked to assume a position in comfortable supine lying. Each subject was asked to check all their muscle groups to make sure they are relaxed as much as possible.

The instructions were given as below:

Starting with your feet, notice any tension, then move upto your ankles, shifting them slightly if they are not relaxed, now your legs, your hips, settle them into the floor. Continue up through your body to your shoulders, letting them drop down. Allow your arms to fall comfortably, with your fingers free of tension and head relaxed. Let your tongue rest in your mouth.

Fig.15 Meditations

❖ **Concentration on chosen stimulus:**

The instructions were given as below:

Subjects were asked to assume supine lying position and to be aware of the ground beneath them. Feel it taking the weight of your body which touches the ground. Concentrate on sensation you are getting from these contact points and feel safely to the ground.

❖ **Return to every day activity:**

The instructions were given as below:

This is the termination of the meditation procedure. When you are ready, let your meditation come to an end. If your meditation comes to an end, slowly move your gaze from the point of focus. Try slowly moving the body round in small circles before you get up. A few gentle stretches will also relax all the muscles.

SESSION-3

Imagery

Imagery is about building pictures in mind. The picture can be pleasant or unpleasant. The pleasant picture induces a feeling of calm. The thoughts evoke and use the senses.

The following instructions were given to the subjects:

If it is a beach, the individual can be asked to imagine a stretch of shoreline, to feel the sand under her feet, to smell the salty air, feel the hot sun and hear the waves breaking and the sea-birds calling.

SESSION-4

Self awareness

The self awareness session included:

1. Awareness of thinking style
2. Awareness of intuitive powers
3. Awareness of feeling(emotion)

The following instructions were given to the subjects

- **Awareness of thinking style:**

The subjects were given a few moments off to make a list of the thoughts that go through their mind and the dialogue that accompanies them, were asked to note it down. Repeat this same later in the day, then, Compare the items among the 3 lists and noticed if any pattern emerges.

The subjects were asked to solve the problems seen in common in the three lists by keeping their mind open to fresh ideas.

- **Awareness of intuitive powers:**

Ask the subjects to sit quietly and allow them to become relaxed. Follow your breathing, next time you breathe out, release all your tension in a long sigh. Scan your body, checking that all your muscles are relaxed. Imagine yourself in a place of beauty and peace.

Just listen to yourself, tune into yourself, be receptive to any ideas that float into your head, listen to your gut feeling, you can judge its merits later, just be open for yourself, when the subjects are ready, bring your visualization to an end.

❖ **Awareness of emotion:**

The subjects were made to be aware of their emotional patterns, share their feelings and express themselves in a controlled or spontaneous way.

The subjects were asked to let go of their feeling by controlled ways such as going for a jogging, (or) workout (or) shouting into pillows (or) kicking a cushion. This emotional belief can clear the subjects mind from any burden and are better able to plan and carry out constructive changes in their life.

SESSION-5

Progressive relaxation training

Progressive muscle relaxation helps the subjects to relax the tension in their muscles associated with stress. They develop awareness of their muscle tension and differentiate between feelings of tension and relaxation.

The instructions were given as below:

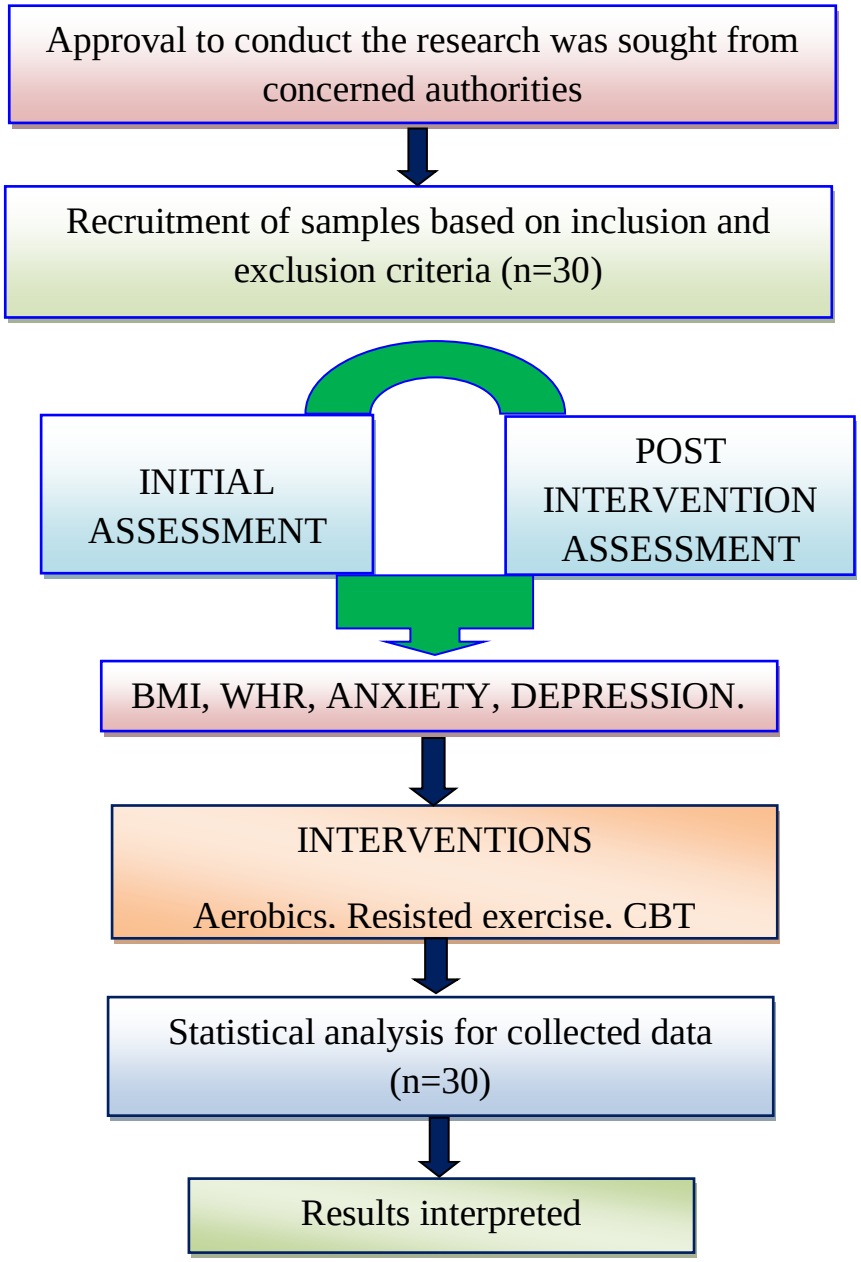
The subjects assume supine lying position and lie down comfortably. They began the session by closing their eyes and clearing their mind, focusing on each part of the body, creating and releasing the tension from head to toe. Tense each muscle group for 5 to 10 seconds before tensing the next group of muscle. Each muscle group may be tensed two or three times until relaxed.

❖ **Face:** The subjects lying in a comfortable position were asked to raise their eyebrows, wrinkle into a deep fawn, close jaw firmly and open mouth wide.

- **Neck:** The subjects pressed their head back into the pillow.
- **Arms:** The subjects were asked to raise their shoulders towards ear (shrug shoulders) brace shoulders back, bend forearm (extend elbows), bend their hands back (extend wrists), bend hands forward (flexion of wrist) and tighten by making fist (clench their hands).
- **Buttock:** The subjects pressed their buttocks together tightly.
- **Legs:** The subjects pressed their thighs down (extend hips), bend foot facing away from the body(plantar flexion of foot), bend foot facing towards the body (dorsiflexion of foot), bend toes facing away from body (flexion of toes) and bend toes facing towards the body (extend toes).

Fig.16 Progressive muscle relaxation

3.9 STUDY METHODOLOGY



3.10 VARIABLES

3.10.1 Independent variables

- Aerobic exercise
- Resisted exercises
- Cognitive behavioural therapy

3.10.2 Dependent variables

- Physical and emotional disturbances

3.11 OUTCOME MEASURES

- Height scale
- BMI- weight scale
- WHC – Inch tape
- Theraband
- Floor mats
- Chairs

3.12 MEASUREMENT TOOLS

- Anxiety – Beck Anxiety Inventory
- Depression – Beck Depression Inventory
- Height – Height scale
- Weight – weight scale
- WHC – Inch tape
- Theraband
- Floor mats
- Stop watch
- Chairs

Fig.17 Theraband

Fig.18 Stopwatch

Fig.19 Weight Scale

Fig. 20 Inch tape

Fig.21 Height scale

3.13 STATISTICAL ANALYSIS:

- Statistical package for the social sciences (SPSS) computer program (version 20) was used for data analysis.

- **Descriptive Statistics:**

➢ Descriptive statistics for the dependent measures, including means and standard deviations, were calculated for the demographic characteristics of the participants.

➢ The formula for calculating the mean is,

$$\bar{d} = \frac{\sum d}{n}$$

Where,

$\sum d$ = sum of each value

n = total number of subjects

➢ The formula for calculating the standard deviation of differences is,

$$SD = \sqrt{\frac{\sum d^2 - n(\bar{d})^2}{n-1}}$$

Where, n-1 is the degree of freedom for testing the hypothesis.

- **Paired ‘t’-test:**

➢ Used to test the differences of the same subjects: Pre-Post comparison.

➢ To find out any statistical difference in BMI, WHR, BDI, BAI scores among PCOS adolescents.

➢ The formula for calculating the Paired ‘t’ test is,

$$t = \frac{\bar{d}}{s}\sqrt{n}$$

Where,

d = difference between the pre-test and post-test

$\bar{d}$ = mean difference

n = total number of subjects

Test statistics (t)

Where,

d = mean difference

SD = standard deviation

n = total number of subjects.

RESULTS

4. RESULTS

4.1 DATA ANALYSIS

Data analysis is a method by which the validity of a research study is evaluated and essential for constructing the validity of a research study purpose. It requires a number of closely related operations beginning from the establishment of a category to raw data through coding, drawing statistical inferences and also finally tabulation of the data that have been collected.

A total of 30 female subjects within an age group of 18-25 years based on the inclusion and exclusion criteria were recruited for this study by purposive sampling. After selection, they were provided with the anxiety and depression questionnaire and values were obtained. The subjects' BMI, WHR scores, BDI and BAI scores were collected pre and post intervention.

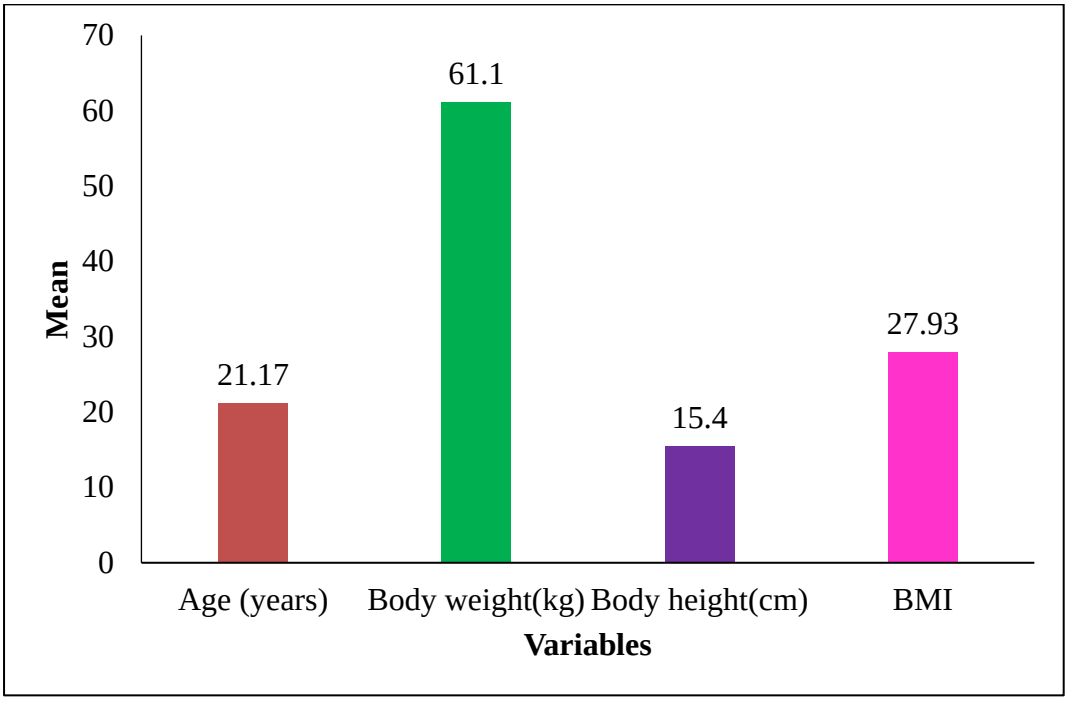
Data collected were statistically analysed. Pre and post test values of the group was obtained on the first day of the treatment and at the end of 5 weeks respectively.

Paired 't' test was used to find out whether there is any significant difference between Pre and Post test values in the group.

Table - 2: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Variables	Mean± SD	Minimum	Maximum
Age (years)	21.17±1.683	18	25
Body weight (kg)	61.1±11.49	40	81.5
Body height (cm)	154.4±4.656	145	164
BMI	27.93±5.535	20	38

GRAPH – 1: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS



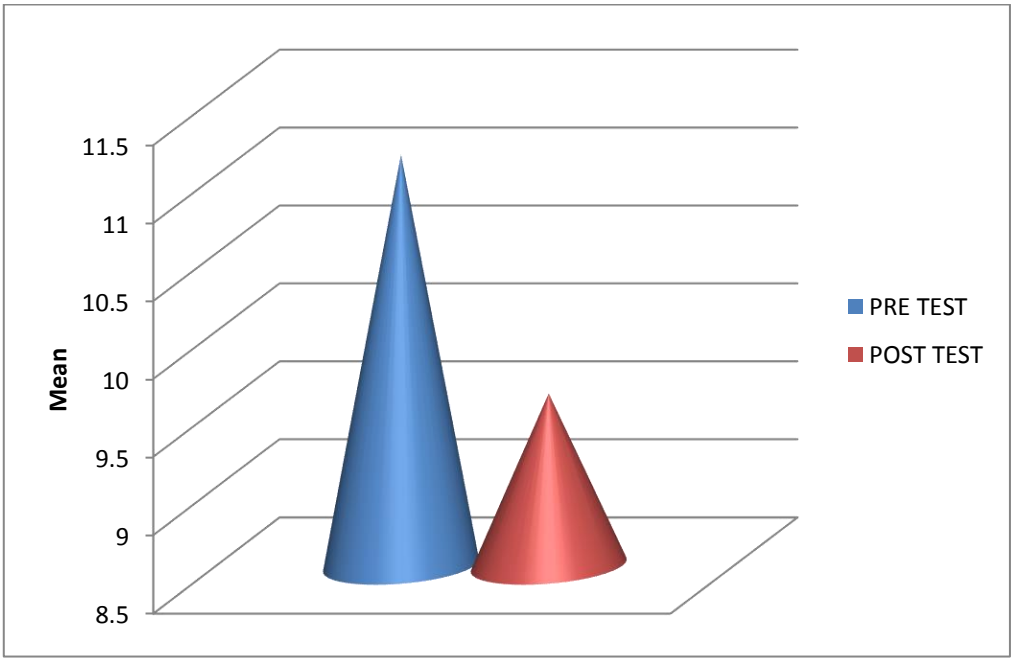
4.2 DATA INTERPRETATION

Interpretation of data means to examine the results from the data analysis, where it forms the conclusion and also exploring the significance of the findings and also suggesting further studies. The values for BMI, WHR, Anxiety and Depression levels for adolescents with PCOS were analysed, interpreted and illustrated below.

Table -3: Anxiety scores before and after the intervention

S. No	Anxiety	BAI scores			"t" Value	Sig (2 tailed) (p <0.05)
		Mean	Mean difference	SD		
1	Pre test	17.13	29	6.03	10.36	0.00
2	Post test	9.60		3.85		

Graph – 2: Pre-test and Post-test mean values of anxiety

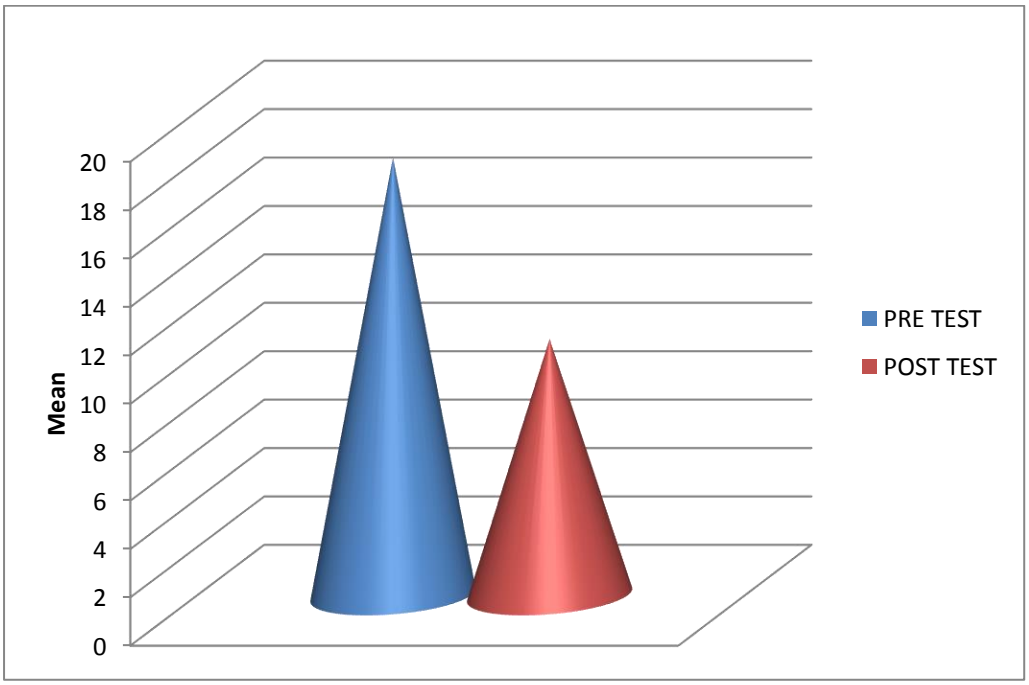


Pre-test and post-test values of BAI were analysed using paired "t" test. The mean value for anxiety in subjects before intervention is 17.13, which is greater than the mean after intervention, where the value is 9.60. The 'p' value is 0.00, which is < 0.05, so there is a significant change in the anxiety score when compared before and after treatment in subjects who received structured exercise program and CBT.

Table - 4: Depression scores before and after the intervention

S. No	Depression	BDI scores			"t" Value	Sig (2 tailed) (p <0.05)
		Mean	Mean difference	SD		
1	Pre test	18.10	29	6.01	11.18	0.00
2	Post test	10.60		7930		

Graph – 3: Pre-test and Post-test mean values of depression

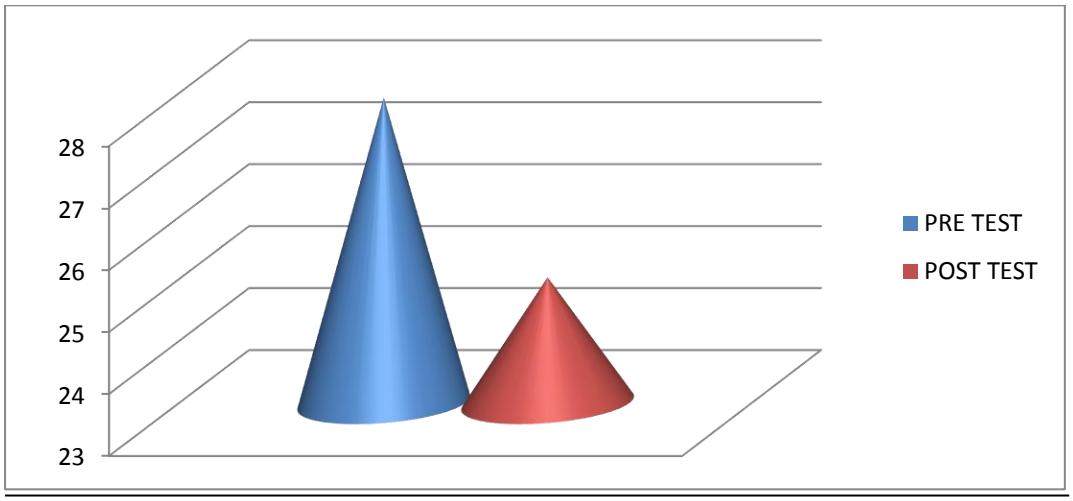


Pre-test and post-test values of BDI were analysed using the paired "t" test. The mean value for depression in subjects before intervention is 18.10, which is greater than the mean after intervention, where the value is 10.60. The 'p' value is 0.00, which is < 0.05, so there is a significant change in the depression score when compared before and after treatment in subjects who received structured exercise program and CBT.

Table -5: BMI values before and after the intervention

S. No	BMI	BMI values			"t" Value	Sig (2 tailed) (p <0.05)
		Mean	Mean difference	SD		
1	Pre test	27.93	29	5.53	6.67	0.00
2	Post test	25.03		4.52		

Graph – 4: Pre-test and Post-test mean values of BMI

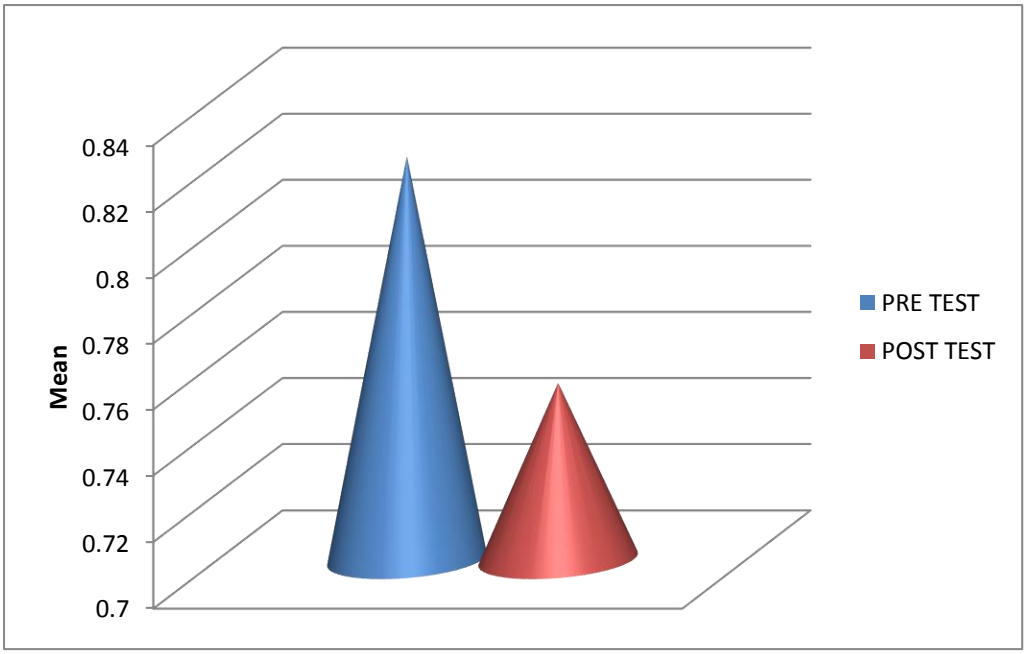


Pre-test and Post-test values of BMI was analysed using paired "t" test. The mean value for BMI in subjects before intervention is 27.93, which is greater than the mean after intervention, where the value is 25.03. The 'p' value is 0.000. This is < 0.05, so there is significant change in the BMI score when compared before and after treatment in subjects who received structured exercise program and CBT.

Table -6: WHR values before and after the intervention

S. No	WHR	WHR values			"t" Value	Sig (2 tailed) (p <0.05)
		Mean	Mean difference	SD		
1	Pre test	.822	29	.0866	11.94	0.00
2	Post test	.753		.082		

Graph – 5: pre-test and post-test values of WHR



Pre-test and Post-test values of WHR was analysed using paired "t" test. The mean value for WHR in subjects before intervention is 27.93, which is greater than the mean after intervention, where the value is 25.03. The 'p' value is 0.00. Which is < 0.05, so there is significant change in the WHR score when compared before and after treatment in subjects who received structured exercise program and CBT.

Discussion

5. DISCUSSION

This study was conducted to analyse the effect of aerobic, resisted exercises and CBT on physical and emotional disturbances among adolescents with PCOS.

PCOS is one of the common endocrine disorders affecting 30-40% of all the women in the reproductive age and is associated with chronic anovulation, hyperandrogenism, insulin resistance and also with an increased prevalence of a number of metabolic risk factors including obesity, abdominal obesity, insulin resistance and compensatory cardiovascular diseases. PCOS also promotes psychological morbidity including depression, poor body image and self-esteem and reduced health-related quality of life. PCOS and psychological difficulties are interrelated with each other. Some researcher believes the psychological difficulties as the cause of PCOS. Many previous studies revealed differences in the scores for anxiety and depression, which were significantly higher in the PCOS women. **Ferrell et al** [(6)] found a correlation between BMI and anxiety and depression. They also suggested that BMI has a small effect on anxiety and depression in adolescents with PCOS.

Angold et al [(8)] explained depression is a common and potentially serious, even life-threatening disorder in women with PCOS.

Several studies have examined the health effects of exercise as part of general lifestyle modification programs; however, few studies have investigated the specific effect of exercise training in PCOS on reproductive outcomes. **Clark A.M** [(9)] Regular exercise in women

with PCOS has benefits on weight loss with improved management of metabolic and reproductive derangements. Exercise is the most preferred and effective method of treatment for PCOS in lifestyle modification **Afsaneh Khademi et al.** [2]

This study has proved that 5 weeks of structured exercise program significantly improved physical and emotional outcomes and also regulated menstrual cycles in women with PCOS. Consistent with our findings, many studies have reported that exercise training has beneficial effects on cardiopulmonary functional capacity and metabolic syndrome parameters in overweight patients with PCOS. [1-3-10] Although other studies have evaluated the impact of diet on the treatment of PCOS, this study found that structured exercise program alone is beneficial in reducing BMI and WHR at least in the short-term. Long term regular exercise may provide better results in metabolic parameters and improve the quality of life of women with PCOS. The effect of exercise may occur more quickly in non-overweight than in overweight PCOS patients.

An aerobic exercise is a planned structured physical activity designed to improve or maintain physical fitness. Resistance training is also effective for improving insulin sensitivity and body composition and can preserve lean tissue during energy restricted weight loss. Combined aerobic and resistance exercise has been reported to be more efficacious for improving insulin sensitivity and glycaemia control and reducing abdominal fat in various obese groups compared with either form of exercise alone.[16]

Leanne M.et al [13] proved that aerobic exercise led to a 40% higher rate of ovulation and greater improvements in SHBG and also resulted in a greater reduction in fasting insulin and insulin resistance. Exercise induced changes in visceral fat and ectopic lipid in nonfatty tissues are probably important components. **R.L. Thomson et al** [18] reported that aerobic exercise improves body composition and a number of CVD risk markers independent of weight loss in overweight and obese individuals. **Randeva et al** [32] showed that exercise such as regular walking, reduces waist-to-hip ratio, an indicator of diabetes and other morbidities and homocysteine levels, an indicator of cardiovascular risk, in overweight PCOS women. **Vigorito et al** [30] showed that anovulatory women with PCOS who underwent aerobic training program restored normal menstrual cyclicity 60% of women.

Polamba et al [29] reported that dieting or aerobic exercise improved menstrual cyclicity and ovulation in overweight women with PCOS. **Volkan Turan et al** [30] reported that the exercise training had positive effects on maximal oxygen consumption (Vo_2 Max), weight and waist circumferences in PCOS patients.

The investigators [32] hypothesized that improved insulin sensitivity was the primary factor involved in ovarian function restoration, they reported that 49% of women with PCOS improved ovulation and menstrual cycles following treatment sessions of energy restricted diet alone or combined with aerobic exercise or aerobic-resistance exercise. Overall, exercise studies have shown improvements in menstrual cyclicity and ovulation in 50% of PCOS women. Improvement in insulin and hormonal profile appear to play important role for improving reproductive function.

In contrast **Orio et al** [29] suggest that the effects of a training program were not maintained after its cessation. They found that non-training resulted in a complete loss of all favourable adaptations obtained from the exercise program. Exercise may need to be maintained throughout life for benefits to be preserved.

CBT techniques are beneficial for reducing distress which includes breathing exercise and relaxation techniques that can promote the circulation of lymph, reduce helplessness, increase level of mental health by decreasing psychological distress in adolescents with PCOS. This study proved that CBT significantly reduced anxiety and depression among adolescents with PCOS. Evidence suggests that reduction in anxiety and depression is achieved through psychological interventions. Consistent with our study, **Leili Mosalanejad et al** [7] showed a mean score of stress, anxiety and depression lowered in subjects who received CBT. **Markus S et al** [10] study confirmed CBT as an effective measure to decrease psychological distress and helps to cope with stressful life events in women with psychological disturbances. **Reinecke M.A et al** [28] explained about CBT as an intervention that seek to promote emotional and behavioural change thought and problem oriented manner, interventions included relaxation, self control and supportive therapy. **Szigethy et al** [15] designed a manual-based CBT approach modified for adolescents with PCOS. They showed promising effects of CBT with significant reductions in obesity, anxiety and depression and also decreased rate of physiological co - morbidities such as menstrual irregularity, high percent of fat mass, blood pressure and sleep related breathing disorders.

The investigators [19] hypothesized that CBT was helpful for adolescents with PCOS to reduce physical (obesity) and emotional (depression) disturbances. It also specifically focuses on physical illness, has motivational concepts help them to adopt healthy lifestyle goals and family-based change that have the potential to help these adolescents long after the intervention completion.

Conclusion

6. CONCLUSION

Aerobic and resisted exercise programme along with cognitive behavioural therapy can be used as an effective non-pharmacological method to help PCOS adolescents overcome their stress and depression levels in addition to reducing their Body Mass Index and Waist Hip Ratio in short term.

Limitations and Recommendations

7. LIMITATIONS AND RECOMMENDATIONS

7.1 LIMITATIONS

- Short study duration.
- Sample size taken was small.
- Lack of appropriate assessment of habitual physical activity.
- The criteria for patient selection was much restricted as only overweight or obese women with PCOS were studied.

7.2 RECOMMENDATIONS

- Study can be done with a larger sample size and longer study duration.
- Further research is necessary to determine the relative contributions of lifestyle including dietary intake in women with PCOS.
- Effects of exercise for PCOS women in a longer duration can be analysed.

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Appendices

APPENDICES

APPENDIX I

1. PHYSIOTHERAPY ASSESSMENT

SUBJECTIVE EXAMINATION

Name: Date of assessment:

Age :

Gender:

Occupation:

Address:

Phone No:

Marital history:

Married/unmarried:

Marital status: Duration: ——————————

Consanguineous / Non consanguineous

Chief complaints:

HISTORY

Past medical history:

Conditions	Duration	Condition	Duration
Diabetes mellitus		PCOD	
Cardiovascular disease		Hypertension	
Thyroid disease		Others	

Surgical history:

Present medical history:

Drug history:

Family history:

CONDITIONS	MOTHER	FATHER
Diabetes mellitus:		
Cardiovascular disease:		
Thyroid disease:		
Hypertension:		
PCOS:		
Respiratory disease:		

Personal history:

Smoking /alcoholic /tobacco /drugs: YES/NO

Bowel and bladder habits:

Sleeping habits:

Menstrual history:

Menarche: years

Menstrual cycle: Regular / Irregular

Cycle length:

Period length:

Quantity: Scanty / Moderate /Profuse

Menstruation: Painful / Painless

Previous treatment history:

Recent Investigations:

OBJECTIVE EXAMINTION

On observation:

Body built: Endomorphic / Ectomorphic / Mesomorphic

Hirsutism [Abnormal hair growth]:

Acne:

On examination:

Physical parameters

Parameters	Pre –test	Post –test
Body weight		
Height		
BMI [Body Mass Index]		

Category	Normal BMI range	Pre –test	Post-test
Very severely underweight	Less than 15		
Severely underweight	From 15.0-16.0		
Underweight	From 16.0-18.5		
Normal [healthy weight]	From 18.5-25		
Over weight	From 25-30		
Obese class I [Moderate obese]	From 30-35		
Obese class2 [severely obese]	From 35-40		
Obese class3 [very severely obese]	Over 40		

	Pre-test	Post-test
Waist circumference		
Hip circumference		
Waist hip ratio		

WHR CHART

Gender	Excellence	Good	Average	At Risk
Female	<0.75	0.75-0.79	0.80-0.85	>0.85

EMOTIONAL PARAMETERS

Parameters	Pre –test	Post –test
Beck Anxiety Inventory		
Beck Depression Inventory		

PHYSIOTHERAPY TREATMENT		
	AEROBIC AND RESISTED	**CBT**

APPENDIX II

Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much.	Moderately - it wasn't pleasant at times	Severely – it bothered me a lot
Numbness or tingling	0	1	2	3
Feeling hot	0	1	2	3
Wobbliness in legs	0	1	2	3
Unable to relax	0	1	2	3
Fear of worst happening	0	1	2	3
Dizzy or lightheaded	0	1	2	3
Heart pounding/racing	0	1	2	3
Unsteady	0	1	2	3
Terrified or afraid	0	1	2	3
Nervous	0	1	2	3
Feeling of choking	0	1	2	3
Hands trembling	0	1	2	3
Shaky / unsteady	0	1	2	3
Fear of losing control	0	1	2	3
Difficulty in breathing	0	1	2	3
Fear of dying	0	1	2	3
Scared	0	1	2	3
Indigestion	0	1	2	3
Faint / lightheaded	0	1	2	3
Face flushed	0	1	2	3
Hot/cold sweats	0	1	2	3
Column Sum				

Scoring - Sum each column. Then sum the column totals to achieve a grand score. Write that score here _____ .

Interpretation

A grand sum between **0 – 21** indicates very low anxiety. That is usually a good thing. However, it is possible that you might be unrealistic in either your assessment which would be denial or that you have learned to "mask" the symptoms commonly associated with anxiety. Too little "anxiety" could indicate that you are detached from yourself, others, or your environment.

A grand sum between ***22 – 35*** indicates moderate anxiety. Your body is trying to tell you something. Look for patterns as to when and why you experience the symptoms described above. For example, if it occurs prior to public speaking and your job requires a lot of presentations you may want to find ways to calm yourself before speaking or let others do some of the presentations. You may have some conflict issues that need to be resolved. Clearly, it is not "panic" time but you want to find ways to manage the stress you feel.

A grand sum that **exceeds 36** is a potential cause for concern. Again, look for patterns or times when you tend to feel the symptoms you have circled. Persistent and high anxiety is not a sign of personal weakness or failure. It is, however, something that needs to be proactively treated or there could be significant impacts to you mentally and physically. You may want to consult a physician or counselor if the feelings persist.

Beck's Depression Inventory

This depression inventory can be self-scored. The scoring scale is at the end of the questionnaire.

1.
- 0 I do not feel sad.
- 1 I feel sad
- 2 I am sad all the time and I can't snap out of it.
- 3 I am so sad and unhappy that I can't stand it.

2.
- 0 I am not particularly discouraged about the future.
- 1 I feel discouraged about the future.
- 2 I feel I have nothing to look forward to.
- 3 I feel the future is hopeless and that things cannot improve.

3.
- 0 I do not feel like a failure.
- 1 I feel I have failed more than the average person.
- 2 As I look back on my life, all I can see is a lot of failures.
- 3 I feel I am a complete failure as a person.

4.
- 0 I get as much satisfaction out of things as I used to.
- 1 I don't enjoy things the way I used to.
- 2 I don't get real satisfaction out of anything anymore.
- 3 I am dissatisfied or bored with everything.

5.
- 0 I don't feel particularly guilty
- 1 I feel guilty a good part of the time.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6.
- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7.
- 0 I don't feel disappointed in myself.
- 1 I am disappointed in myself.
- 2 I am disgusted with myself.
- 3 I hate myself.

8.
- 0 I don't feel I am any worse than anybody else.
- 1 I am critical of myself for my weaknesses or mistakes.
- 2 I blame myself all the time for my faults.
- 3 I blame myself for everything bad that happens.

9.
- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10.
- 0 I don't cry any more than usual.
- 1 I cry more now than I used to.
- 2 I cry all the time now.
- 3 I used to be able to cry, but now I can't cry even though I want to.

11.

0	I am no more irritated by things than I ever was.
1	I am slightly more irritated now than usual.
2	I am quite annoyed or irritated a good deal of the time.
3	I feel irritated all the time.

12.

0	I have not lost interest in other people.
1	I am less interested in other people than I used to be.
2	I have lost most of my interest in other people.
3	I have lost all of my interest in other people.

13.

0	I make decisions about as well as I ever could.
1	I put off making decisions more than I used to.
2	I have greater difficulty in making decisions more than I used to.
3	I can't make decisions at all anymore.

14.

0	I don't feel that I look any worse than I used to.
1	I am worried that I am looking old or unattractive.
2	I feel there are permanent changes in my appearance that make me look unattractive
3	I believe that I look ugly.

15.

0	I can work about as well as before.
1	It takes an extra effort to get started at doing something.
2	I have to push myself very hard to do anything.
3	I can't do any work at all.

16.

0	I can sleep as well as usual.
1	I don't sleep as well as I used to.
2	I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3	I wake up several hours earlier than I used to and cannot get back to sleep.

17.

0	I don't get more tired than usual.
1	I get tired more easily than I used to.
2	I get tired from doing almost anything.
3	I am too tired to do anything.

18.

0	My appetite is no worse than usual.
1	My appetite is not as good as it used to be.
2	My appetite is much worse now.
3	I have no appetite at all anymore.

19.

0	I haven't lost much weight, if any, lately.
1	I have lost more than five pounds.
2	I have lost more than ten pounds.
3	I have lost more than fifteen pounds.

BMI CHART

(**Classification according to WHO IN 1997**)

Category	Normal BMI range
Very severely underweight	Less than 15
Severely underweight	From 15.0-16.0
Underweight	From 16.0-18.5
Normal [healthy weight]	From 18.5-25
Over weight	From 25-30
Obese class I [moderate obese]	From 30-35
Obese class II [severely obese]	From 35-40
Obese III [very severely obese]	Over 40

WHR CHART

Gender	Excellence	Good	Average	At Risk
Female	<0.75	0.75-0.79	0.80-0.85	>0.85

APPENDIX III

CONSENT FORM

I, Mrs/Ms._____

voluntarily agree to participate in the research study conducted entitled **"Effectiveness of a structured exercise programme along with cognitive behavioural therapy on physical and emotional disturbances among adolescents with PCOS,**" which is being conducted at Department of physiotherapy, Sri Ramakrishna Hospital, Coimbatore.

I understand that the study involves measurement of my weight, BMI, waist hip ratio, anxiety and depression, through the completion of the intervention protocol.

I acknowledge that:

- I have received an adequate explanation of possible risks and inconveniences that may arise from participation in this study.
- I have received a copy and read fully the written information concerning the study and any questions have been answered to my satisfaction.
- I understand that all the information I provide will be identified by code only.
- I understand that the information I provide will be kept on secured premises and will be available to the study investigator only except at my request or on my authorization.
- I understand that I am free to withdraw my consent at any time during the study and that the information which has been collected will not be used in this case.

PARTICULARS	NAME	SIGNATURE	DATE	TIME
PATIENT				
PARTICIPANT				